DOT MATRIX
LIQUID CRYSTAL DISPLAY
MODULE

COMPANY NAME：_____

USER ‘MANUAL

LMG-S16D80 Serial

LCD Module Description: _____

PROPOSED BY		APPROVED
Design	Approved	

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LCM SAMPLE APPROVAL

(液 晶 顯 示 模 組 樣 品 確 認 書)

1．PART A:FILLED BY SDEC TECH（由 SDEC 填寫）

1) COMPANY NAME（客戶名稱）：_____

2) SDEC ITEM NO.（產品型號）：_____

3) CUSTOMER ITEM NO.（客戶產品型號）：_____

4) LCM Function (LCM 內容)：

A	LCD TYPE (LCD 種類)：☐ TN, ☐ HTN, ☐ STN, ☐ FSTN (☐ POSITIVE/正向, ☐ NEGATIVE/反向, ☐ BLACK MASK/內黑絲印)
B	VIEWING AREA (視角方向)：☐ 3H, ☐ 6H, ☐ 9H, ☐ 12H
C	POLARIZER COLOR (偏光板顏色)：☐ GRAY/灰色, ☐ YELLOW GREEN/黃綠色, ☐ BLUE/藍色, ☐ BLACK/黑色
D	BACKLIGHT COLOR (背光顏色)：☐ YELLOW GREEN/黃綠光, ☐ ORANGE/橘光 ☐ RED/紅光, ☐ BLUE/藍光, ☐ GREEN/翠綠光, ☐ WHITE/白光
E	TEMPERATURE (溫度)：☐ NORMAL/常溫, ■ WIDE/廣溫
F	PCB RESISTOR (PCB 板電阻)：R1(KΩ), R2/R3/R5/R6(2KΩ), R4(KΩ), R7(Ω), R11(Ω) , R12(Ω), D1( )
G	CONTROL IC (控制 IC)：LC7981

SAMPLE DELIVERY DATE（出樣日期）：_____

2．PART B:FILLED BY CUSTOMER（請客戶填寫）

CHECK LIST ITEMS（檢查項目）：	OK	NG	REASON（原因）
1).LCM SIZE AND THICKNESS:(LCM 尺寸及厚度)：	☐	☐	_____
2).POLARIZER COLOR：（偏光板色澤）：	☐	☐	_____
3).ELECTRO CHARACTERISTIC：（電氣特性）：	☐	☐	_____
4).VIEWING AREA（視角範圍）：	☐	☐	_____
5).BACKLIGHT ILLIMINATION（背光亮度）：	☐	☐	_____
6).TEMPERATURE RANGE（溫度範圍）：	☐	☐	_____

APPROVED BY（批准）： DATE OF APPROVAL（批准日期）：

0.1 SDEC LCD MODULE NUMBERING SYSTEM

LM	C	—	S	T	C	2	E	16	D	L	Y	Y	—	
[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]		[13]

LM	G	—	S	S		12	A	64	U	E	G	W	—	
[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]		[13]

0.2 SDEC LCD MODULE VARIATION LIST

NO	ITEM		DESCRIPTION			
[1]	LCD MODULE		LIQUID CRYSTAL DISPLAY MODULE			
[2]	LCM MODULE		D DIGITS MODEL	C CHARACTER MODEL	G GRAPHIC MODEL	
[3]	LCM OF FUNCTION		B BIG SIZE TYPE		S SMALL/NORMAL TYPE	
[4]	LCD MODEL		T TN LCD		H HTN LCD	
			S STN LCD		F FSTN LCD	
[5]	IC PACKING		PACKAGE TYPE	C CHIP(OR COG)TYPE	T TAB TYPE	
[A]	STANDARD TYPE LCM	[6]	CHARACTER MODEL：NUMBER OF LINES		GRAPHIC MODEL：WIDE SIDE OF DOTS	
		[7]	FROM A TO Z			
		[8]	CHARACTER MODEL:NUMBER OF CHARACTER		GRAPHIC MODEL:HIGH SIDE OF DOTS	
[B]	STANDARD OR CUSTOM DESIGNED TYPE LCM	[6]	DIGITS MODEL：YEAR+MONTH+NUMBER			
		[7]	CHARACTER MODEL：CHARACTER+LINES+NUMBER			
		[8]	GRAPHIC MODEL：WIDE SIDE DOTS+HIGH SIDE DOTS+NUMBER			
[9]	VIEWING ANGLE		R 3 O'CLOCK	D 6 O'CLOCK	L 9 O'CLOCK	U 12 O'CLOCK
[10]	BACKLIGHT		R WITHOUT BACKLIGHT		E EL (TRANSFLECTIVE)	
			L ARRAY LED (TRANSFLECTIVE)		F FL (TRANSMISSIVE)	
[11]	POLARIZER COLOR		G GRAY		Y YELLOW GREEN	
			N NEGATIVE STN TYPE : BLUE			
			NEGATIVE FSTN TYPE : BLACK			
[12]	BACKLIGHT COLOR		B BLUE		G GREEN	
			O ORANGE		R RED	
			W WHITE		Y YELLOW GREEN	
[13]	VERSION		01 ENGLISH-JAPANESE		02 ENGLISH-EURPEAN	
			03 ENGLISH-RUSSIAN		E EDGE LED BACKLIGHT	

※All of our STN Panel belong "WIDE TEMPERATURE"

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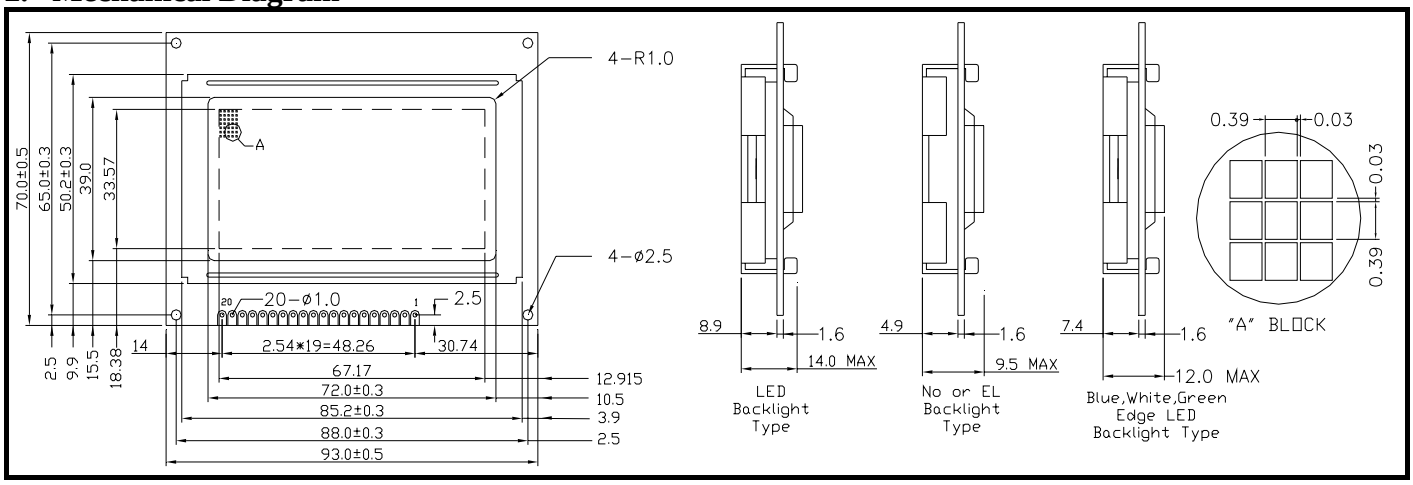
1. Mechanical Specification

ITEM	STANDARD VALUE			UNIT
DOT MATRIX FORMAT	160 × 80 DOTS			--
CONTROLLER IC	LC7981 OR EQUIVALENT			
MODULE DIMENSION NO BACKLIGHT, EL BACKLIGHT	93.0 (W) X 70.0 (H) X 9.5 (T)			mm
MODULE DIMENSION ARRAY LED BACKLIGHT	93.0 (W) X 70.0 (H) X 14.0 (T)			mm
MODULE DIMENSION EDGE LED BACKLIGHT (BLUE)	93.0 (W) X 70.0 (H) X 12.0 (T)			mm
VIEWING DISPLAY AREA	72.0W × 39.0H			mm
ACTIVE DISPLAY AREA	67.17W × 33.57H			mm
DOT SIZE	0.39W × 0.39H			mm
DOT PITCH	0.42W × 0.42H			mm
● EL USE INVERTER TYPE	SDEC-I002A			
INVERTER INPUT	DC +5V	V	40	mA
INVERTER OUTPUT	AC 90 ~ 110	V	400 ~ 700	Hz
BACKLIGHT HALF-LIFT TIME	3,000			HR.
● ARRAY LED BACKLIGHT COLOR	YELLOW GREEN OR ORANGE OR RED			
BACKLIGHT INPUT	DC +4.2V	V	300	mA
BACKLIGHT HALF-LIFT TIME	30,000			HR.
● EDGE LED BACKLIGHT COLOR	BLUE OR GREEN OR WHITE			
BACKLIGHT INPUT	DC+3.2V	V	78	mA
BACKLIGHT HALF-LIFT TIME	3,000 (AVOID LIGHTING CONTINUOUSLY)			HR.

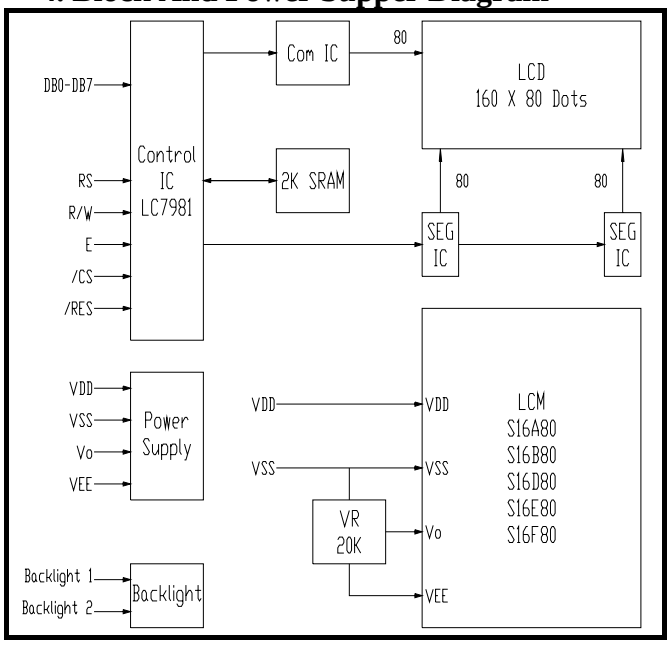
2. Mechanical Diagram



3. Interface Pin Connections

NO	SYMBOL	LEVEL	FUNCTION
1	VSS	--	Ground
2	VDD	--	Power supply for logic circuit
3	Vo	--	Power supply for LCD circuit
4	D/I	H/L	Data/Instruction
5	R/W	H/L	Read / Write
6	E	H,H→L	Enable Signal
7	DB0	H/L	Data Bit 0
8	DB1	H/L	Data Bit 1
9	DB2	H/L	Data Bit 2
10	DB3	H/L	Data Bit 3
11	DB4	H/L	Data Bit 4
12	DB5	H/L	Data Bit 5
13	DB6	H/L	Data Bit 6
14	DB7	H/L	Data Bit 7
15	/CS	L	Chip enable
16	/DISP OFF	L	Display off signal
17	/RES	L	Controller reset
18	VEE	--	Negative voltage output
19	A	--	LED Backlight + (+5V)
20	K	--	LED Backlight - (0V)

4. Block And Power Supper Diagram



5. Environmental absolute maximum ratings

ITEM	OPERATING		STORAGE		REMARKS
	MIN.	MAX.	MIN.	MAX.	--
Ambient Temperature	-20°C	+70 °C	-30 °C	+80 °C	NOTE 1
Humidity	NOTE 1		NOTE 2		Without Condensation
Vibration	--	4.9m/s^2	--	19.6m/s^2	XYZ Directions
Shock	--	29.4m/s^2	--	490.0m/s^2	XYZ Directions

Remarks:

NOTE (1) : Ta at 60 °C : 50 HR Max.

NOTE (2) : Ta < 40 °C : 95% RH Max.

Ta > 40 °C : Absolute humidity must be lower than the humidity of 95% at 40 °C.

6. Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Logic Circuit Power Supply	V_{DD} - V_{SS}	--	4.75	5.0	5.25	V
LCD Driver Power Supply	V_{LCD}	--	9.7	10.0	10.3	V
Input Voltage	V_{IH}	V_{DD} = 5V±0.25	0.7*V_{DD}	--	V_{DD}	V
	V_{IL}		0	--	0.3*V_{DD}	V
Power Supply Current	I_{DD}	V_{DD} = 5V	--	--	10.0	mA
	I_{EE}	V_{EE} = -10V	--	--	2.0	mA

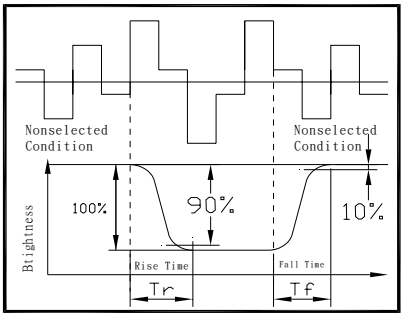
7. Optical Characteristics

Ta at 25℃

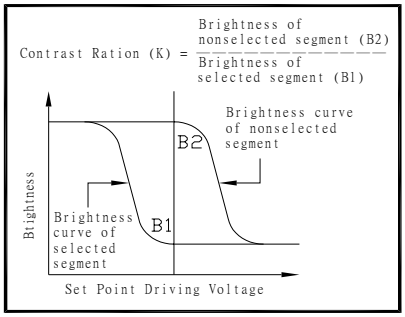
ITEM	SYM	CONDITION	MIN.	TYPE	MAX.	UNIT
VIEW ANGLE (TOP／BOTTOM)	θ1 / θ2	CR≧5	——	45/35	——	deg.
VIEW ANGLE (LEFT／RIGHT)	φ1 / φ2	CR≧5	——	35/35	——	deg.
CONTRAST RATIO	CR	——	——	7	——	——
RESPONSE TIME (RISE)	TON／Tr	——	——	160	--	mS
RESPONSE TIME (DECAY)	TOFF／Tf	——	——	210	--	mS

8. Optical Definitions

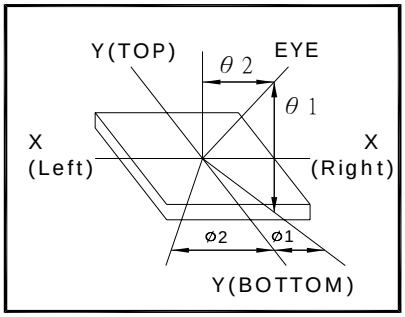
Response Time



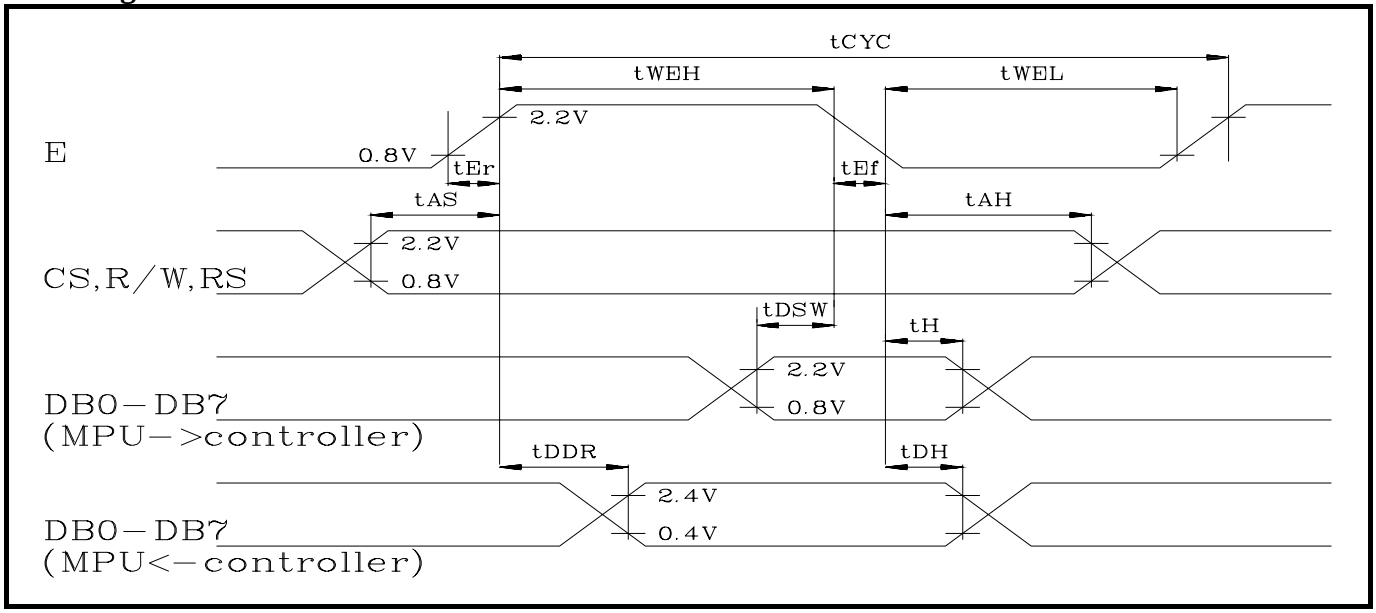
Contrast Ration


Contrast Ration (K) = Brightness of nonselected segment (B2) / Brightness of selected segment (B1)
Brightness curve of nonselected segment
B2
B1
Brightness curve of selected segment
Brightness
Set Point Driving Voltage

View Angle



9. Timing Control



ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Enable cycle time	tCYC	1000	--	--	ns
Enable pulse width High/Low level	tWEH,tWEL	450	--	--	ns
Enable rise/fall time	tEr,tEf	--	--	25	ns
Setup time	tAS	140	--	--	ns
Data setup time	tDSW	225	--	--	ns
Data delay time	tDDR	--	--	225	ns*
Data hold time	tH	10	--	--	ns
Address hold time	tAH	10	--	--	ns
Output data hold time	tDH	20	--	--	ns

Note: * The following load circuit is connected for specification

10. Display Control Instructions

10.1 Description of command

Display is controlled by writing data into the instruction register and 13 data registers. The RS signal distinguishes the instruction register from the data registers. 8-bit data is written into the instruction register with RS=1, and the code of data register is specified. After that, the 8-bit data is written in the data register and the specified instruction is executed with RS=0. During the execution of the instruction, no new instruction can be accepted. Since the busy flag is set during this, read the busy flag and make sure it is 0 before writing the next instruction.

10.1.1 Mode Control

Code $"00" (hexadecimal) written into the instruction register specifies the mode control register.

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	0	0	0	0
Mode Control Register	0	0	0	0	Mode Data					

DB5	DB4	DB3	DB2	DB1	DB0	Cursor/blink	CG	Graphic/Character
1/0	1/0	0	0	0	0	Cursor OFF	Internal CG	Character Mode
		0	1			Cursor ON		
		1	0			Cursor OFF, Character blink		
		1	1			Cursor blink		
		0	0		1	Cursor OFF	External CG	
		0	1			Cursor ON		
		1	0			Cursor OFF, Character blink		
		1	1			Cursor blink		
		0	0	1	0	--	--	Graphic Mode

1: Master Mode 0: Slave Mode *Normal is set Master Mode

1: Display ON 0: Display OFF

10.1.2 Set Character Pitch

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	0	0	0	1
Character Pitch Register	0	0	(Vp -1) Binary				0	(Hp -1) Binary		

Vp indicates the number of vertical dots per character. The space between the vertically-displayed characters is considered for determination. This value is meaningful only during character display (in the character mode) and becomes invalid in the graphic mode. The Hp indicates the number of horizontal dots per character in display including the space between horizontally displayed characters. In the graphic mode, the Hp indicates the number of bits of 1 byte display data to be displayed. Three Hp values:

Hp	DB2	DB1	DB0	
6	1	0	1	Horizontal character pitch 6
7	1	1	0	Horizontal character pitch 7
8	1	1	1	Horizontal character pitch 8

10.1.3 Set Number of Characters

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	0	0	1	0
Number of Character Register	0	0	0	(Hn -1) Binary						

Hn indicates the number of horizontal characters in the character mode r the number of horizontal bytes in the graphic mode. If the total sum of horizontal dots on the screen is taken as n, n = Hp x Hn. Hn can be set with an even number of 2 to 128 (decimal).

10.1.4 Set Number of Time Division (inverse of display duty ratio)

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	0	0	1	1
Character Pitch Register	0	0	(Nx -1) Binary							

Nx indicates the number of time division in multiplex display. 1/Nx is a display duty ration. A value of 1 to 128 (decimal) can be set to Nx.

10.1.5 Set Cursor Position

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	0	1	0	0
Cursor Position Register	0	0	0	0	0	0	(Cp -1) Binary			

Cp indicates the position in a character where the cursor is displayed in the character mode. For example, in 5x7 dot font, the cursor is displayed under a character by specifying Cp=8 (decimal). The cursor horizontal length is equal to the horizontal character pitch Hp. A value of 1 to 16 (decimal) can be set to Cp. If a smaller value than the number of vertical character pitches Vp is set (Cp≦Vp), and a character is overlapped with the cursor, the cursor has higher priority of display (at cursor display ON). If Cp is greater than Vp, no cursor is displayed. The cursor horizontal length is equal to Hp.

10.1.6 Set Display Start Low Order Address

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	0	0	0
Display Start Address Register (low order byte)	0	0	(Start low order address) Binary							

10.1.7 Set Display start High Order Address

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	0	0	1
Display Start Address Register (high order byte)	0	0	(Start high order address) Binary							

These instructions cause display start addresses to be written in the display start address registers. The display start address indicates a RAM address at which the data displayed at the top left end on the screen is stored. In the graphic mode, the start address is composed of high/low order 16 bits. In the character display, it is composed of he lower 4 bits of high order address (DB3 - DB4) and 8 bits of low order address. The upper 4 bits of high order address are ignored.

10.1.8 Set Cursor Address (low order) (RAM write low order address)

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	0	1	0
Cursor Address Counter (low order byte)	0	0	(Cursor low order address) Binary							

10.1.9 Set Cursor Address (high order) (RAM write high address)

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	0	1	1
Cursor Address Counter (high order byte)	0	0	(Cursor high order address) Binary							

These instructions cause cursor addresses to be written in the cursor address counters. The cursor address indicates and address for sending or receiving display data and character codes to or from the RAM. Namely, data at address specified by the cursor address are read/written. In the character mode, the cursor is displayed at the digit specified by the cursor address. A cursor address consists of the low-order address (8 bits) and the high-order address (8 bits). Satisfy the following requirements.

1	When you want to rewrite (set) both the low order address and the high order address.	Set the low order address and then set the high order address.
2	When you want to rewrite only the low order address.	Don‘t fail to set the high order address again after setting the low order address.
3	When you want to rewrite only the high order address.	Set the high order address. You don‘t have to set the low order address again.

The cursor address counter is a 16 bit up-count with SET and RESET functions. When the bit N Changes from 1 to 0, the bit N+1 is added by 1. When setting the low order address, the LSB (bit 1) of the high order address is added by 1 if the MSB (bit *) of the low order address changes from 1 to 0. Therefore, set both the low order address and the high order address as shown in above table.

10.1.10 Write Display Data

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	1	0	0
RAM	0	0	MSB (pattern data, character code) LSB							

After the code $“OC” is written into the instruction register with RS=1, 8 bit data with RS=0 should be written into the data register. This data is transferred to the RAM specified by the cursor address as display data or character code. The cursor address is increased by 1 after this operation.

10.1.11 Read Display Data

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	1	0	1
RAM	0	0	MSB (pattern data, character code) LSB							

Data can be read from the RAM with RS=0 after writing code $“0D” into the instruction register. The read procedure is as follows:
This instruction outputs the contents of data output register on Data Bus (DB0 to DB7) and then transfers RAM data specified by a cursor address to the data output register, also increasing the cursor address by 1. After setting the cursor address, correct data is not output at the first read but at the second time. Thus, make one dummy read when reading data after setting the cursor address.

10.1.12 Clear Bit

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	1	1	0
Bit Set Register	0	0	0	0	0	0	0	(NB-1)Binary		

10.1.13 Set Bit

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Instruction Register	0	1	0	0	0	0	1	1	1	1
Bit Set Register	0	0	0	0	0	0	0	(NB-1)Binary		

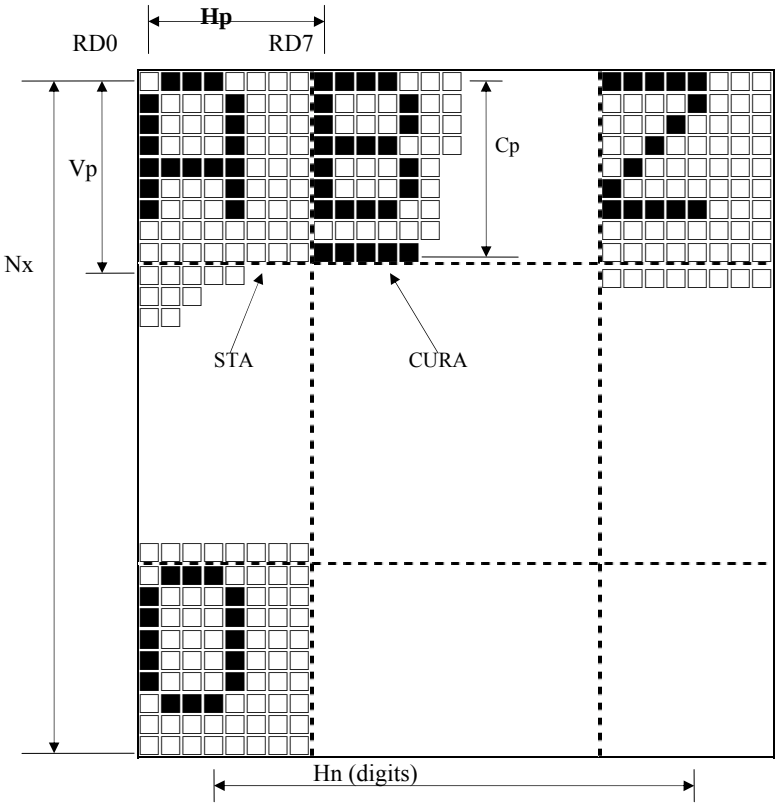
The Clear/Set bit instruction sets 1 bit in a byte of display data RAM to 0 or 1, respectively. The position of the bit in a byte is specified by NB and RAM address is specified by cursor address. After the execution of the instruction, the cursor address is automatically increased by 1. NB is a value of 1 to 8. NB=1 and NB=8 indicates LSB and MSB, respectively.

10.1.14 Read Busy Flag

REGISTER	R/W	RS	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Busy Flag	0	1	1/0	*						

When the read mode is set with RS=1, the busy flag is output to DB7. The busy flag is set to 1 during the execution of any of instructions (1) to (13). After the execution, it is set to 0. The next instruction can be accepted. No instruction can be accepted when busy flag=1. Before executing an instruction or writing data, perform a busy flag check to make sure that busy flag is 0. When data is written in the register (RS=1), no busy flag changes. Thus, no busy flag check is required just after the write operation into the instruction register with RS=1. The busy flag can be read without specifying any instruction register.

10.2 Display variables



Symbol	Name	Meaning	Value
Hp	Horizontal character pitch	Lateral character pitch	6 to 8 dots
Hn	Number of horizontal characters	Number of lateral characters per line (number of digits) in the character mode or number of bytes per line in the graphic mode.	2 to 128 digits (an even number)
Vp	Vertical character pitch	Longitudinal character pitch.	1 to 16 dots
Cp	Cursor position	Line number on which the cursor can be displayed.	
nx	Number of time division	Inverse of display duty ratio	1 to 128 lines

Note: If the number of vertical dots on screen is taken as m, and the number of horizontal dots as n,

1/m = 1/Nx = display duty ratio

n = Hp x Hn, m/Vp = Number of display lines

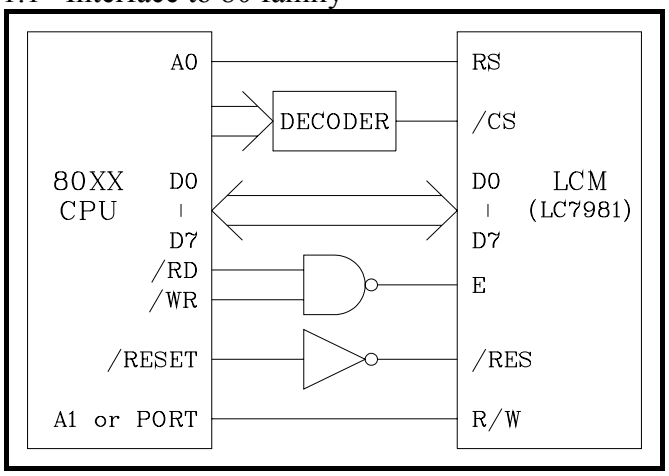
Cp≦Vp

10.3 Initialize LCM register set list

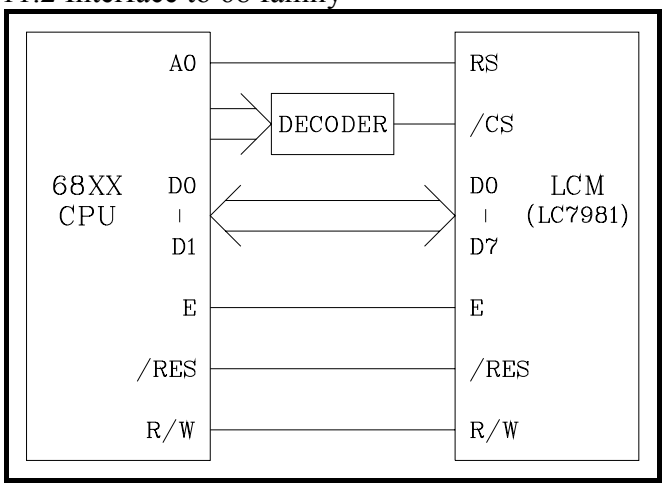
Register number	**0H**	**1H**	**2H**	**3H**	**4H**	**8H**	**9H**	**AH**	**BH**
Character mode	1CH	77H	13H	4FH	07H	00H	00H	00H	00H
Graphics mode	12H	77H	13H	4FH	07H	00H	00H	00H	00H

11. Interface For LCM

1.1 Interface to 80 family



11.2 Interface to 68 family



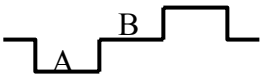
12. CG ROM Pattern

CHARACTER PATTERN CHART(5×7DOTS+CURSOR)

Lower 4 bit \ Higher 4 bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
××××0000	CG RAM (1)		0	@	P	`	p		ー	タ	ミ	α	p
××××0001	(2)	!	1	A	Q	a	q	。	ア	チ	ム	ä	q
××××0010	(3)	"	2	B	R	b	r	「	イ	ツ	メ	ß	θ
××××0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ	ε	∞
××××0100	(5)	$	4	D	T	d	t	、	エ	ト	ヤ	μ	Ω
××××0101	(6)	%	5	E	U	e	u	・	オ	ナ	ユ	σ	ü
××××0110	(7)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
××××0111	(8)	'	7	G	W	g	w	ァ	キ	ヌ	ラ	g	π
××××1000	(1)	(	8	H	X	h	x	ィ	ク	ネ	リ	√	x̄
××××1001	(2)	)	9	I	Y	i	y	ゥ	ケ	ノ	ル	-1	y
××××1010	(3)	*	:	J	Z	j	z	ェ	コ	ハ	レ	j	千
××××1011	(4)	+	;	K	[	k	{	ォ	サ	ヒ	ロ	万	円
××××1100	(5)	,	<	L	¥	l	|	ャ	シ	フ	ワ	¢	円
××××1101	(6)	-	=	M	]	m	}	ュ	ス	ヘ	ン	Ł	÷
××××1110	(7)	.	>	N	^	n	→	ョ	セ	ホ	゛	ñ	
××××1111	(8)	/	?	O	_	o	←	ッ	ソ	マ	°	ö	■

Lower 4-bit (D0-D3) of Character Code (Hexadecimal)

13. Reliability Condition

			TN Type		STN/FSTN Type	
			Normal Temp.	Wide Temp.	Normal Temp.	Wide Temp.
Viewing Angle	Horizontal (Φ1/Φ2)		±30°	±30°	±40°	±40°
	Vertical (Θ2/Θ1)		15° to 35°	15° to 35°	35° to 55°	35° to 55°
Operating Temperature			0 to 50℃	-20 to 70℃	0 to 50℃	*-20 to 70℃
Storage Temperature			-10 to 60℃	-30 to 80℃	-10 to 60℃	*-30 to 80℃
High Temperature (Power Off)			240 Hours @60℃	240 Hours @80℃	240 Hours @60℃	240 Hours @80℃
Low Temperature (Power Off)			240 Hours @-10℃	240 Hours @-30℃	240 Hours @-10℃	240 Hours @-30℃
High Temperature (Power On)			240 Hours @50℃	240 Hours @70℃	240 Hours @50℃	240 Hours @70℃
Low Temperature (Power On)			240 Hours @0℃	240 Hours @-20℃	240 Hours @0℃	240 Hours @-20℃
High Temperature & High Humidity (Power Off)			40℃/90%RH 240 Hours	40℃/90%RH 240 Hours	40℃/90%RH 240 Hours	40℃/90%RH 240 Hours
Thermal Shock 5 Cycle 		A	60min@0℃	60min@-20℃	60min@0℃	60min@-20℃
		B	5min@25℃	5min@25℃	5min@25℃	5min@25℃
		C	60min@50℃	60min@70℃	60min@50℃	60min@70℃
LCD Lift (25℃/ 45%RH)			50,000 Hours	50,000 Hours	50,000 Hours	50,000 Hours

*Wide temp. version may not available for some products, Please consult our sales engineer or representative.

14. Functional Test & Inspection Criteria

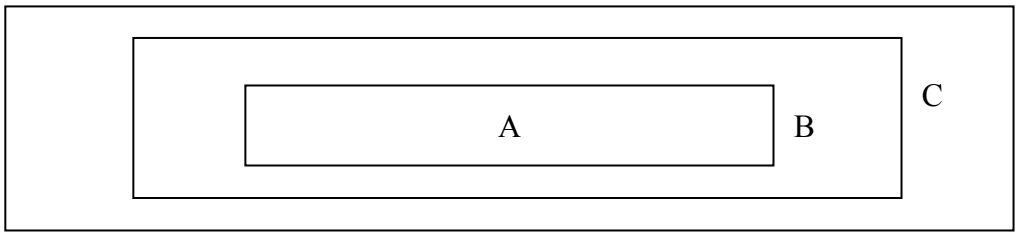
14.1 Sample plan

Sample plan according to MIL-STD-105D level 2, and acceptance/rejection criteria is.
Base on : Major defect : AQL 0.65 Minor defect : AQL 2.5

14.2Inspection condition

Viewing distance for cosmetic inspection is 30cm with bare eyes, and under an environment of 800 lus (20W) light intensity. All direction for inspecting the sample should be within 45° against perpendicular line.

14.3Definition of Inspection Zone in LCD



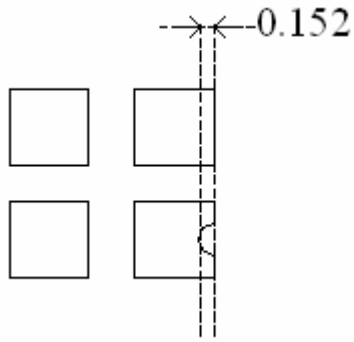
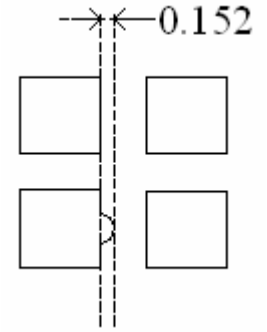
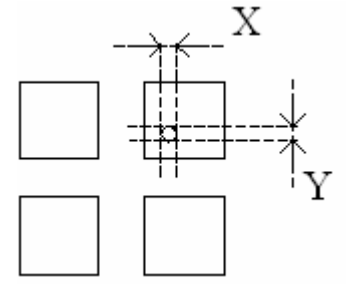
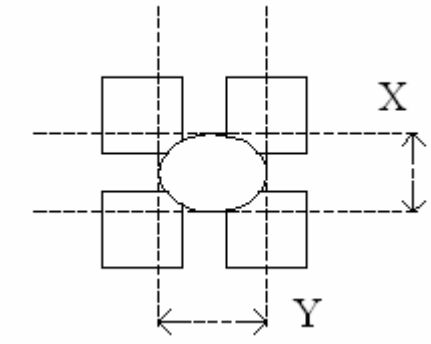
Zone A : Character / Digit area
Zone B : Viewing area except Zone A (Zone A + Zone B = minimum Viewing area)
Zone C : Outside viewing area (invisible area after assembly in customer's product)
Note : As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

14.4Major Defect

All functional defects such as open (or missing segment), short, contrast differential, excess power consumption, smearing, leakage, etc. and overall outline dimension beyond the drawing. Are classified as major defects.

14.5 Inspection Parameters And Glass Pixel(偏光板和玻璃圖像檢驗)

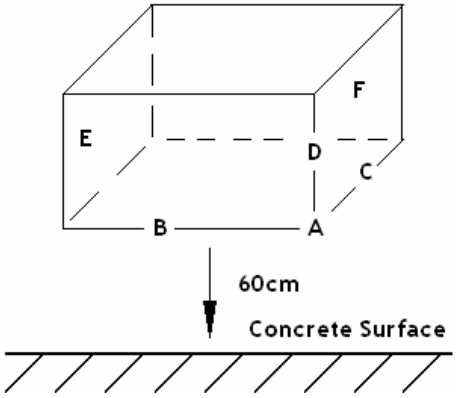
<table>
<tr><th>NO</th><th>Polarizer(偏光板)</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots And Piercing
(黑/白點和刺孔)</td><td>
<table>
<tr><th>Dimension
(面積)</th><th>Acceptable number
(可接受數量)</th></tr>
<tr><td>D＜0.15</td><td>*</td></tr>
<tr><td>0.15≦D≦0.2</td><td>4</td></tr>
<tr><td>0.2≦D≦0.25</td><td>2</td></tr>
<tr><td>D≦0.3</td><td>0</td></tr>
</table>
D/面積=(Length/長度+Width/寬度)/2 => * ：Disregard(忽略)
</td></tr>
<tr><td>2</td><td>Scratch
(刮傷)</td><td>
<table>
<tr><th>X(mm)</th><th>Y(mm)</th><th>Acceptable number
(可接受數量)</th></tr>
<tr><td>*</td><td>0.04≧W</td><td>*</td></tr>
<tr><td>3.0≧L</td><td>0.06≧W</td><td>4</td></tr>
<tr><td>2.0≧L</td><td>0.08≧W</td><td>2</td></tr>
<tr><td>－</td><td>0.1≧W</td><td>0</td></tr>
</table>
X：Length(長度) Y：Width(寬度) *：Disregard(忽略)
</td></tr>
<tr><td>3</td><td>Air Bubbles
(between glass & polarizer)
氣泡(玻璃跟偏光板之間)</td><td>
<table>
<tr><th>Dimension
(面積)</th><th>Acceptable number
(可接受數量)</th></tr>
<tr><td>D≦0.15</td><td>*</td></tr>
<tr><td>0.15＜D≦0.25</td><td>2</td></tr>
<tr><td>0.25＜D</td><td>0</td></tr>
</table>
*：Disregard (忽略)
</td></tr>
</table>

4	Glass of Pixel (玻璃的圖像)	(1)Pixel shape (with Dent) /圖像凹度  ●Less than 0.152 mm is no counted (小於 0.152mm 者不計) (2)Pixel shape (with Projection)/圖像凹度  Should not be connected next pixel (點與點間不可先連接) (3)Deformation/變形  (X + Y) / 2 ≦ 0.15mm ●Less than 0.1 mm is no counted (小於 0.15mm 者不計) (4) Deformation/變形  (X + Y) / 2 ≦ 0.3mm ●Less than 0.3 mm is no counted (小於 0.3mm 者不計)

15. Test (測試條件) – Normal Temperature (常溫)

No change no display and in operation under the following text condition.
(在不改變原先顯示下進行以下測試操作)

Conditions ： Unless otherwise specified, test will be conducted under the following condition.
Temperature ： 20±5 ℃ Humidity： 40±5%RH
Tests will be not conducted under functioning state.
(條件：除非其他特殊情況，否則測試將以溫度：20±5 ℃，濕度：40±5%RH 為主)

NO	Parameter	Conditions	Notes
1	High Temperature Operating	50℃±2 ℃ , 96 hrs (operation state) (96 小時，溫度 50℃±2 ℃電源開啟的操作情況下)	
2	Low Temperature Operating	0℃±2 ℃ , 96 hrs (operation state) (96 小時，溫度 0℃±2 ℃電源開啟的操作情況下)	1
3	High Temperature Storage	60℃±2 ℃ , 96 hrs (96 小時，溫度 60℃±2 ℃電源關閉靜態操作下)	2
4	Low Temperature Storage	-10℃±2 ℃ , 96 hrs (96 小時，溫度-10℃±2 ℃電源關閉靜態操作下)	1 , 2
5	Damp Proof Test	40℃±2 ℃ , 85 ~ 90%RH , 96hr (96 小時，溫度：40℃±2 ℃，濕度：85~90%RH 電源關閉靜態操作下)	1 , 2
6	Vibration Test	Total fixed amplitude ： 1.5 mm (完全固定輻射：1.5mm) Vibration Frequency ： 10 ～ 55 Hz (震動頻率：10~55 Hz) One cycle 60 seconds to 3 directions of X , Y , Z for each 15 minutes (每一個循環 X，Y，Z 軸方向各做 60 秒，連續做 5 次，共計 15 分鐘)	3
7	Shock Test	To be measured after dropping from 60cm high on the concrete surface in packing state. (包裝材從 60 公分高的地方向地面落下)  Dropping method comer dropping (角落落下方式) A comer：once Edge dropping (側邊落下) B , C , D edge : once Face dropping (表面落下) E , F , G face : once	

Note 1：No dew condensation to be observed. (不要在”水氣凝結點”下觀察)

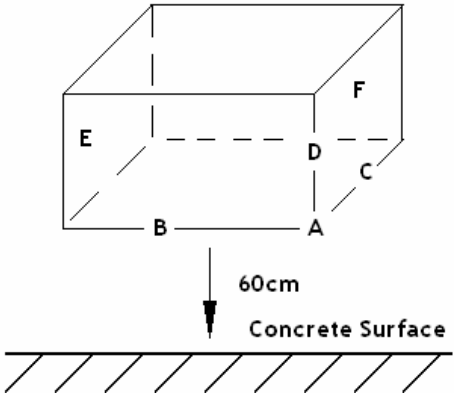
Note 2：The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after removed from the test chamber
(從實驗室移出後，放在一般常溫 (溫度：25℃，濕度：45%RH)，
且四小時後通電流或電壓，看它是否能正常動作)

Note 3：Vibration test will be conducted to the product itself without putting it in a container.
(在震動測試下，產品本身不需容器即能自行傳導)

16. Test (測試條件) – Wide Temperature (廣溫)

No change no display and in operation under the following text condition.
(在不改變原先顯示下進行以下測試操作)

Conditions ： Unless otherwise specified, test will be conducted under the following condition.
Temperature ： 20±5 ℃ Humidity： 40±5%RH
Tests will be not conducted under functioning state.
(條件：除非其他特殊情況，否則測試將以溫度：20±5 ℃，濕度：40±5%RH 為主)

NO	Parameter	Conditions	Notes
1	High Temperature Operating	70℃±2 ℃ , 96 hrs (operation state) (96 小時，溫度 70℃±2 ℃電源開啟的操作情況下)	
2	Low Temperature Operating	-20℃±2 ℃ , 96 hrs (operation state) (96 小時，溫度-20℃±2 ℃電源開啟的操作情況下)	1
3	High Temperature Storage	80℃±2 ℃ , 96 hrs (96 小時，溫度 80℃±2 ℃電源關閉靜態操作下)	2
4	Low Temperature Storage	-30℃±2 ℃ , 96 hrs (96 小時，溫度-30℃±2 ℃電源關閉靜態操作下)	1 , 2
5	Damp Proof Test	40℃±2 ℃ , 85 ~ 90%RH , 96hr (96 小時，溫度：40℃±2 ℃，濕度：85~90%RH 電源關閉靜態操作下)	1 , 2
6	Vibration Test	Total fixed amplitude ： 1.5 mm (完全固定輻射：1.5mm) Vibration Frequency ： 10 ～ 55 Hz (震動頻率：10~55 Hz) One cycle 60 seconds to 3 directions of X , Y , Z for each 15 minutes (每一個循環 X，Y，Z 軸方向各做 60 秒，連續做 5 次，共計 15 分鐘)	3
7	Shock Test	To be measured after dropping from 60cm high on the concrete surface in packing state. (包裝材從 60 公分高的地方向地面落下)  Dropping method comer dropping (角落落下方式) A comer：once Edge dropping (側邊落下) B , C , D edge : once Face dropping (表面落下) E , F , G face : once	

Note 1：No dew condensation to be observed. (不要在”水氣凝結點”下觀察)

Note 2：The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after removed from the test chamber
(從實驗室移出後，放在一般常溫 (溫度：25℃，濕度：45%RH)，
且四小時後通電流或電壓，看它是否能正常動作)

Note 3：Vibration test will be conducted to the product itself without putting it in a container.
(在震動測試下，產品本身不需容器即能自行傳導)

17. Precautions Against Product Handling [產品使用注意事項]：

The following precautions will guide you in handling our product correctly.
[下列警戒引導正確地使用產品]

17.1 Care of the LCD module against static electricity discharge. [LCD 模組靜電注意事項]

17.1.1 When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.
[操作模組時，避免操作者身體接地及任何造成靜電的設備同時使用，強烈建議(橡膠製)抗靜電墊的使用，以免工作台面遭受到電氣干擾]

17.1.2 Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.
[緩慢小心地移除 LCD 模組上的保護膜，以防靜電產生]

17.1.3 Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
[避免穿著人造合成的工作服，建議棉質或是有傳導性的纖維質料]

17.2 Liquid crystal display devices (LCD devices) [液晶螢幕顯示器的組成]

17.2.1 The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it. [偏光板是軟性原料製成，請勿刮傷]

17.2.2 The LCD device panel used in the LCM is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.
[模組使用的玻璃為平面玻璃，避免任何強烈的機械撞擊，且觸碰時請小心]

17.3 When the LCD module alone must be stored form long periods of time
[當 LCD 模組須長時間存放時]

17.3.1 Protect the modules from excessive external forces. [避免外力壓迫]

17.3.2 Protect the modules from high temperature and humidity. [避免處於高溫高濕下]

17.3.3 Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
[遠離陽光曝曬或直接曝露在紫外線下]

17.4 Use the module with a power supply that is equipped with an overcurrent protector circuit, since the module is not provided with this protective feature.
[因為模組本身沒有防護，所以模組的供應器應配有過高電流的保護迴路]

17.5 Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.
[LCD 破裂液晶外漏時，切勿食下液晶；若手或衣服接觸到液晶，請立刻用肥皂清洗]

17.6 Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.
[當金屬框並沒焊接於 PCB 板上時，無法保證使用金屬框是具有傳導性，請連絡我們商討適當方式傳導]

17.7 For models which use CCFL [CCFL 的模組]:

17.7.1 High voltage of 1000V or greater is applied to the CCFL cable connector area.
[CCFL 排線連接器用於 1000V 以上的高電壓]

17.7.2 Protect CCFL cables from rubbing against the unit and thus causing the wire jacket to become worn. [CCFL 排線必須有保護 CCFL 與模組磨擦，以防 CCFL 外殼受到損害]

17.7.3 The use of CCFLs for extended periods of time at low temperatures will significantly shorten their service life. [長時間低溫使用 CCFL 會明顯縮減其使用壽命]

17.8 For models which use touch panels [觸控式面板模組]:

17.8.1 Do not stack up modules since they can be damaged by components on neighboring modules. [勿堆疊模組以防損壞]

17.8.2 Do not place heavy objects on top of the product. This could cause glass breakage. [勿將重物放置在產品上，會導致玻璃破損]

17.9 For models which use COG & TAB [COG 及 TAB 模組]:

17.9.1 The mechanical strength of the product is low since the IC chip is faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces. [由於 IC 晶片表面無防護，所以抗壓力有限，須加強保護以防外力]

17.9.2 Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact. [勿暴露 IC 晶片以防電氣干擾，且避免安裝 IC 時有任何電子接觸]

17.10 Models which use flexible cable, heat seal, or TAB [加有軟排線、熱封條或 TAB 的模組]:

17.10.1 In order to maintain reliability, do not touch or hold by the connector area. [以維持產品信賴度，請勿觸碰或握住連接器]

17.10.2 Avoid any bending, pulling, or other excessive force, which can result in broken connections. [避免彎曲、拉扯或過度力量，會造成連接器損壞]

17.11 In case of acrylic plate is attached to front side of LCD panel, cloudiness (very small cracks) can occur on acrylic plate, being influenced by some components generated from polarizer film. Please check and evaluate those acrylic materials carefully before use. [貼在 LCD 玻璃前面的壓克力板若有模糊情況(微小裂縫)，即會影響偏光板；使用前請仔細確認壓克力材質]

17.12 In case of buffer material such as cushion/gasket is assembled into LCD module, it may have an adverse effect on connecting parts (LCD panel-TCP/ HEAT SEAL/ FPC, PCB-TCP/HEAT SEAL/FPC, TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC) depending on its materials. Please check and evaluate these materials carefully before use. [緩衝原料像是減震墊/襯墊，或許會對連接器(LCD panel-TCP/ HEAT SEAL/ FPC, PCB-TCP/HEAT SEAL/FPC, TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC)造成反效果，使用前請仔細確認材料]

18. Warranty [保證]：

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.
[此產品的製造是依照客戶的規格，被使用於客戶的一般電子產品上，保證產品製作根據出貨的規格，若產品的使用不是在一般電子設備，而組裝於下列產品上則無法受理（如醫療產品、核心電源控制設備、航空設備、防火及保全系統，或任何相關儀器會直接影響人類生命等），若模組使用於上述的儀器，則需商討各別產品責任義務的協定]

18.1 We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
[不受理因強大外力衝擊造成產品的缺陷]

18.2 We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
[不受理產品出貨後，因額外加工(包含拆裝及重新封包)造成的缺陷]

18.3 We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product, has passed your company's acceptance inspection procedures.
[不受理通過貴公司檢驗流程後，由於靜電造成產品的缺陷]

18.4 We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.
[不受理因在客戶產品生產線端所產生的第三人智慧財產權責任,除非與我司生產製造方法有直接關係的問題]

18.5 When the product is in CCFL models, CCFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.
[產品是 CCFL 模組時，CCFL 的壽命及亮度將取決於連接器的性能、漏電量等；無法受理因 CCFL 造成產品性能的缺陷]

18.6 SDEC will not be held responsible for any quality guarantee issue for defect products longer than 1(one) year from SDEC production which ever comes later.
[出廠超過一年的瑕疵品，任何品質擔保則不受理]